We're Going to a Beach Party

Theme: Impact of Plastics

Introduction

This activity encourages youth to be responsible consumers by carefully considering the implications of their purchase choices. Youth explore the consequences of different material choices by deciding what kind of plates, forks, and eating utensils to bring to a party.

Time needed

- 20-25 minutes to DO the activity and discuss what you did

Do & Learn Goal

- Work together as a group to compare materials and make decisions about party supplies
- Defend their supply decisions using their understanding of bioplastics and petroleum-based plastics
- Youth identity 2 plastic consumer choices that positively impact the environment.

Background Information

The decisions we make about the materials we use for everyday activities have a lasting impact on the world around us. Designers interested in **sustainability** use a technique called life cycle assessment to analyze the environmental impacts of products. **Life cycle assessment** takes into account all stages of a product's life including extracting raw materials, processing, manufacturing, distribution, use, repair, and disposal (often called "cradle to grave"). This broad focus allows designers to consider systematic environmental concerns such as energy use, the impact of extracting raw materials and related potential pollutants, and how the flow of materials affects the environment.

The life cycle assessment includes four main stages:

- Goal Definition: describe the product and the environmental considerations under review for the assessment.
- Life Cycle Inventory: identify and determine the amounts of energy, water, and raw materials used as well as any environmental emissions (air, waste, etc.) in the product life cycle.
- Life Cycle Impact: analyze the potential human and ecological effects of the energy, water, raw material usage and emissions.

- Interpretation: Evaluate the results of the Life Cycle Inventory and Life Cycle Impact analyses to select the preferred product

Choosing materials that are **biodegradable** (such as **bioplastics**) or from **renewable** sources have a different impact on sustainability than those made from **non-renewable** materials. This activity encourages youth to be responsible consumers by carefully considering the life-cycle implications of their purchase choices.

Do!

Materials:

- Assemble kits of cups, plates, and cutlery for each team. These items can be purchased from office supply stores, department stores, Amazon, and other online retailers, or brought from home.
    - Team A: plastic plate, fork, and cup
    - Team B: Metal plate, fork, and cup.
    - Team C: Styrofoam plate, plastic fork, and styrofoam cup
    - Team D: Bioplastic (PLA is a type of commonly found consumer bioplastic) plate, fork, and cup. Biodegradable polymers are usually stamped with #7 or often says "PLA" below it.
- Consider how you will divide youth into their groups.

Questions:

- Ask youth to think about what kinds of utensils they use everyday at home (probably more durable items like glass, metal, etc.) and what they might pack for a school lunch or field trip (probably more plastic items).
- Have you or your family had to bring plates and cups for a meal with friends before? How did you decide what to use?
- Can you think of durable (reusable) utensils you already have at home that would be an appropriate choice for a beach party or picnic?

In this opening conversation, listen for how youth or families made decisions about what to bring. Point out decision making criteria that emerges from group discussion, especially highlighting:

- Convenience
- Cost
- Function (for example, for hot and cold foods)
- Environmental impact
- Items one already has vs purchasing

Procedure:

1. Share the following story to set the stage for this challenge:
    a. *You and 50 of your friends have decided to take advantage of a beautiful day and have a party at the beach. Everyone is bringing something. Your team has been asked to bring plates, cups, and eating utensils for everyone. What kind of materials will you bring and why?*
2. Tell youth that each team will be randomly assigned one of 4 materials for the party:
    a. Materials A: Plastic plate, fork, and cup
    b. Materials B: Metal plate, fork, and cup
    c. Materials C: Styrofoam plate, plastic fork, and styrofoam cup
    d. Materials D: Bioplastic (e.g. PLA) plate, fork, and cup
3. Split the group into 4 teams (A - D). Try to have teams of 3 or 4 youth. If your group is more than 16 youth, consider having multiple teams use Materials A-D. Give each team a packet of materials (a plate, fork, cup made out of their assigned materials) with the associated costs.
    a. Team A: Plastic plate, fork, and cup - $0.40 per person
    b. Team B: Metal plate, fork, and cup - Tell the group their materials have no cost for this particular picnic because they are bringing them from home. A later discussion point may talk about long-term and short-term costs. These materials are more expensive in the short-term but can be used many times and can be less expensive over time.
    c. Team C: Styrofoam plate, plastic fork, and styrofoam cup - $0.13 per person
    d. Team D: Biodegradable polymer plate, fork, and cup - $0.65 per person
4. Ask each team to:
    a. Discuss the costs and benefits of their material based on these criteria:
        i. Convenience
        ii. Cost (provide price for each)
        iii. Function (for hot and cold foods, etc.)
        iv. Environmental impact
        v. Team's choice (team can add their own 5th criteria if they have one)
    b. Rate their material on each criteria on a scale of 1 to 5 (where 5 is the best for each category)
    c. Decide if they would bring their material to a beach picnic and why or why not.
5. As teams explore the costs and benefits of their material, encourage them to experiment with the materials. For example, they might want to pour hot water into their cup, etc.

    a. Safety note: PLA cups are only meant for cold beverages and will melt under hot conditions. Be prepared for the PLA cup to melt/leak hot water and provide appropriate safety measures to prevent scalding.
6. Bring all teams back together to share with the whole group.
    a. Compare and contrast the different reasoning strategies each team used.
    b. Look for patterns in the group - was there consensus in decision making?
    c. Ask each team to present their final analysis.
    d. Record each team's ratings on a flipchart or screen so the whole group can see.

Reflect

- Was there one criteria that a team weighed heavier than others? Why?
- Would the team's decision have been different with different circumstances? (Would the decision be different if it was a party at your house instead of at the beach, for example?)
- Consider the environmental aspects of the decision-making process. How will the decision about the materials you choose for the picnic affect the environment? Which aspects of the product's life cycle (product materials, creation, disposal, etc.) played a role your decision? Which parts of the life cycle were not considered? For example, choosing metal cups, plates, and forks usually costs much more than disposable items but the value comes with re-using the materials over time.

Learn More!

Tell someone why **you are a scientist** or **teach them a new word** you learned:

- **Biodegradable**: a substance or object capable of being decomposed by bacteria or other living organisms
- **Bioplastic:** Plastic made from renewable plant materials.
- **Life Cycle Assessment:** takes into account all stages of a product's life including extracting raw materials, processing, manufacturing, distribution, use, repair, and disposal (often called "cradle to grave") that allows designers to consider systematic environmental concerns in design decisions.
- **Non-renewable:** a material made from resources that are only available in limited quantities and take a long time to be replenished (i.e. millions of years)
- **Sustainability**: able to be maintained at a certain rate or level

- **Renewable**: a material made from naturally occurring resources that can be replenished, often within one person's lifetime

Learn more about life cycle assessment:

- Life Cycle Assessment (LCA) Overview from the U.S. General Services Administration Sustainable Facilities Tool: https://sftool.gov/plan/400/life-cycle-assessment-lca-overview
- Explore sustainable design options for building design with the Sustainable Facilities Tool: https://sftool.gov/Explore
- Guidelines for Social Life Cycle Assessment of Products, United Nations Environment Programme: http://www.unep.fr/shared/publications/pdf/DTIx1164xPA-guidelines_sLCA.pdf
- Environmental Benefits Calculator: https://www.natureworksllc.com/Resources/Environ-Benefits-Calc

This activity is part of **Sustainable Polymers: Taking Action to Solve the Challenge of Plastics,** a 4-H STEM curriculum for grades 6-8. Please visit 4hpolymers.org to download the full curriculum.